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ABSTRACT

The purpose of this study was to determine the status of the use of computers in the schools within the West Kootenay region of southeastern British Columbia (Canada). Thirty teachers, librarians, principals, and senior district administrators were interviewed to determine the computing background of the interviewees and how they were using computers in education. Results indicated that computers are being used quite extensively in the schools; the ratio of computers to students in the school ranged from 1:6 to 1:10; the equipment in use varied; the most common software applications were word processing, spreadsheets, and database and communications applications; computers were in use in all grade levels from kindergarten to grade 12; and CD-ROMs and electronic catalog systems were common in primary, elementary, and secondary school libraries. This report is presented in five sections: (1) Introduction--problem statement, purpose of the study, significance, assumptions, limitations and definitions; (2) Review of the Literature--importance, current status, uses, benefits, and future role of computers in education, and barriers to computer use in education; (3) Research Methodology--problem restatement, population and sample, research design, description of the interview questionnaire, administration and analysis of interviews; (4) Results and Analyses--selection of interviewees, interview process, question summaries, findings, status of computers in West Kootenay schools; and (5) Findings, Conclusions and Recommendations. Appendixes contain the interview questionnaire and a list of interviewees with background data. (Contains 19 references.) (ALF)

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THE STATUS OF COMPUTING IN PUBLIC SCHOOLS IN THE WEST KOOTENAY REGION OF BRITISH COLUMBIA

JULY 1992

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THE STATUS OF COMPUTING IN PUBLIC SCHOOLS IN THE WEST KOOTENAY REGION OF BRITISH COLUMBIA

by

Leonel L. Perra

California Cluster

A Practicum Report Submitted in Partial Fulfillment

of the Requirements for the Degree of Doctor of Sciences

Nova University

July, 1992

ABSTRACT

The purpose of this study was to determine the status of the use of computers in the schools within the West Kootenay region of southeastern British Columbia. Thirty teachers, librarians, principals and senior district administrators were interviewed to determine the computing background of the interviewees and how they were using computers in education.

The interviews indicated that computers are being used quite extensively in the West Kootenay schools. The ratio of computers to students in the schools ranged from one to six to one to ten. The equipment currently in use varied from a few Apple IIe's, Amiga's and XT's to mostly 286's and 386's in IBM/compatible districts or MacIntosh 512's, SE's and LC's in districts which had opted for the latter line of hardware.

The most common software application was MSWorks, an integrated package from Microsoft. MSWorks includes word processor, spreadsheet, database and communications applications. Computers were in use at all grade levels from kindergarten to grade 12. CD-Rom's and electronic catalogue systems were common in primary, elementary and secondary school libraries.

The evolution of computer use in schools in the West Kootenay region has progressed well beyond a handful of machines in a quiet corner of the school.

ACKNOWLEDGEMENTS

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CHAPTER ONE

INTRODUCTION

The West Kootenay region is located in southeastern British Columbia and is populated by approximately 75,000 residents. The population growth rate for the region has been very stable throughout the eighties and projections are for zero to low growth in the nineties. The region includes six school districts with a total school enrolment of about 13,000. Each district has one or more elementary schools, which usually include kindergarten through grade six, and one or two secondary schools. The secondary schools are either junior secondary - grades seven through nine, junior-senior secondary - grades seven through twelve, or senior secondary - grades ten through twelve. In the smaller communities, the school includes all grades - kindergarten through twelve.

The West Kootenay region has three major population centers of close to 10,000 residents each, a dozen or more communities with populations ranging from 500 to 1,500 and one community with a population of 5,000. The region is multicultural with most ethnic stock being European. On the goods producing side, the economy is driven by forestry, mining and hydro electric generation. Tourism

and government services, including health and education, are the major contributors to the service economy. Although the region has a significant output in hard goods, it is not one of the wealthier areas of the province. Unemployment in the West Kootenay tends to be about 40-50% higher than the provincial average unemployment rate. Modernization and automation programs among many of the major employers in the region have been a contributing factor to the higher levels of unemployment, especially in the goods producing organizations.

The stable population growth for the region has resulted in stable enrolments in the school system. Although there have been several school renovation programs carried out throughout the region, very few new schools have been built in the last twelve years. The occasional new facilities which have been constructed, tended to be elementary schools. These have been built because of population shifts or as replacements due to old age or fire damage. The lack of new facility construction has not released significant resources for new equipment, however. The development of information systems in the schools system in the West Kootenay has evolved rather slowly and on a haphazard basis. Some pilot projects have been undertaken

in the region as the result of sporadic initiatives; however, there does not appear to be any consistency among the various schools, between or within districts.

Problem Statement

The West Kootenay region is the primary catchment area for Selkirk College. The lack of coherent and well known information systems development plans for the schools of this catchment area makes it difficult for Selkirk College to plan its own information systems evolution in a manner which accommodates and is responsive to the background and experiences of these entrants. The College is in the process of preparing an information systems development plan for its own purposes. Better information on the current status and changes occurring in the regional schools is seen as an essential component to this development and planning process.

Purpose of the Study

The purpose of this study is to determine the current state of information systems and their use in the West Kootenay school districts. The study attempts to gather general information on the following:

1. The type of equipment and software which is available

within the various grade levels.

2. How these information systems are used to support instructional activities.

3. The level of support teachers receive in the use of information systems.

4. What the teachers see as possible information systems developments in the near future.

5. What information systems the teachers would like to have for instructional purposes.

6. What type of support structures these information systems and uses would require.

Significance of the Study

The secondary schools of the West Kootenay region are the primary source of new entrants to Selkirk College. There is very little doubt that computers will continue to play an increasing role in all aspects of society and this will manifest itself in the classrooms of the college and its feeder schools. The evolution of information systems in the schools will have a direct impact on many of the students who enter Selkirk College. It is incumbent upon the college to ensure that its programs and courses are not redundant with

respect to what the entering students have already learnt. Clearly, the institution can wait until the students arrive before determining their background in information systems. A preferred alternative, however, is to predetermine the "state of the art" as it exists in the schools and to provide relevant services based on this analysis. This study will also be of benefit to the regional school district administrators, who will then be able to use a comprehensive overview of the current and desired information systems when developing future plans. The views and opinions of teachers respecting district practices and policies will also be of benefit.

Assumptions

For the purposes of this study it was assumed that:

(1) The individuals selected by the district superintendents met the criteria as described on page 28 in this study.

(2) The interviewees answered the questions honestly and to the best of their abilities.

(3) The interviewees who participated in the study were a representative cross section of district professionals who are active users of computers in education.

(4) The resources available for implementing computers in

education varied with the size of the district.

Limitations

The following limitations applied to this study:

(1) The population interviewed for this study was a very small portion of the total population.

(2) The interviewees possessed varying degrees of expertise in the use of computers in education.

(3) The questions used may not have elicited the same response from different interviewees.

Definitions

Computer: For the purposes of this study, a computer is an electronic device which digitizes information and carries out computer instructions. A computer includes mainframe, minicomputer and microcomputer equipment.

Computer use in education: For the purposes of this study, a computer use in education is any use or activity which involves a computer for the purposes of education. These purposes include both instructional and administrative activities.

Information system: An information system is comprised of computer(s), software, peripherals and related equipment needed to

carry out a computer related activity. An information system can be either a small or a very large system.

The terms information technology, educational technology and information systems are used interchangeably.

CHAPTER TWO

REVIEW OF THE LITERATURE

The Importance of Computers in Education

"Education costs too much and delivers too little at a time when our emerging information society needs it more than ever," claimed Perelmen (as cited in Marien, 1991:141). The reasons for this statement include a serious lack of productivity improvement by the education sector in comparison to many other sectors, a dearth of capital investment when compared to any other industry, low purchase rates of computers for schools in comparison to the purchase rates for the rest of society, the purchase of outdated equipment, and because of age, the lack of use of this equipment. Perelman (as cited in Merien, 1991:142) found that employer-based education spent 300 times more on computer supported education than was the case in public education.

In a similar vein, Van Horn stated that the tools of education for pupils are usually "stubby pencils, rumpled paper, and blunt crayons" and for teachers, they consist of "chalk, chalkboards, books, faded dittos and a few primitive devices such as overhead and filmstrip projectors" (1991:528). Fox (as cited in Van Horn) expressed

the view that:

> Teachers need to be afforded an opportunity to enhance their productivity, give their students the benefits that the most sophisticated instructional delivery systems offer, make an impact on hitherto insoluble education problems, and bring education into the 21st century on an equal footing with business and government (1991:528).

Van Horn agreed with the views of Heuston and Sculley (as cited in Van Horn) in that the focus must shift from trying to improve the productivity of the teacher to improving the productivity of the learner (1991:528). Students working with computers can assume a greater responsibility for their own learning and thus achieve greater productivity. "Increases in productivity can come about through the introduction of new tools that let workers do exponentially more work. History is full of examples of this fact in every sector - except education" (Van Horn, 1991:530). Gagne suggested that "there are signs that our present delivery system is nearing or has reached maturity, and that it will be very difficult, within current technical, cultural, and political restraints, to increase academic productivity qualitatively" (1987:286).

The Current Status of Computers in Education

Back in 1983, Becker (as cited in Streibel) made the observation that "microcomputers are being introduced into public and private schools at an exponential rate and this trend shows no signs of abating" (1986:137). Electronic Learning's 1987 US survey on the number of students per computer found a national average of 34.5 students per computer (Juliussen and Juliussen, 1988:7.7). The 1988 survey indicated an improvement in the ratio of computers to students - about one computer to 25 students (Bruder, 1988). Similar statistics appeared in the British TES Survey (Wellington and MacDonald, 1989:B24) whereby the 1987 ratio was 39:1 and for 1988 the figures had improved to 28:1. A UNESCO survey found that Canada had an average 87:1 ratio in 1984 and was projecting a ratio of 46:1 for 1986. The British Columbia Ministry of Education undertook a survey of its 75 school districts to determine the extent of microcomputers in the system. The June 1991 BC Education Technology Survey Draft Report indicated an overall average of one microcomputer per 14 students. The evidence seems to support the view, expressed by Becker, that extensive growth is taking place in the relative number of computers to the number of students; however,

the actual gains appear negligible to others. Why then this dichotomy? On the surface, a ratio of 1:25 seems satisfactory; however, it reflects about one microcomputer per classroom, a level that is not likely to have a significant impact on teaching and learning. Even the much improved ratio of 1:14 only provides two computers per classroom. The ratios are also based on the total inventory accumulated over the past ten to twelve years and as Perelman has suggested, many microcomputers are no longer relevant to today's software and learning needs and are stored in closets or gathering dust on shelves. There is some evidence to suggest that the growth in total microcomputers has subsided. Feuer, senior analyst with the Office of Technology Assessment of the US Congress, in 1989 estimated a ratio of 1 to 30 (1989:37). Other possible explanations for the current situation in the slow growth of computer use in education will be explored later in this chapter.

The Uses of Computers in Education

Ultimately, the value of computers in education will depend on how well they are used by teachers and learners (Heermann, 1988:3). Streibel categorized computer use under three general headings: drill and practice, tutorial, and simulation and programming (1986:137).

Heermann's taxonomy is similar and described the uses as teaching machine, "information" resource, simulation and tool (1988:31-2). These categories are broad definitions and can include a significant number of the current practices. However, they represent the earlier dimensions of computer use in education. Today's instructional environment includes various instructional management and curriculum development tools, telecommunications hardware and software, and low cost expert systems software.

Under the drill and practice, or teaching machine, categories would be found the usual range of computer assisted instruction applications which guide the learner through a sequential question and answer process. The more sophisticated programs have the capability of tracking errors, discovering patterns, and providing corrective instructions (Van Horn, 1991:530). Tutorials are somewhat similar and usually consist of an instruction set followed by an opportunity for response from the student.

Simulation software varies considerably in its sophistication as a teaching/learning resource. Simple simulations are defined as non-interactive by Heermann (1988:59) and present the user with a model of reality. More sophisticated applications permit the user to alter

the environment and see the results of the change.

An area of significant growth in computer use is in telecommunications (Wellington and MacDonald, 1989:B27, Bruder, 1988:45) or what Heermann concluded under "computer as resource" (1988:71). The automation of libraries, CD-ROM indexes, and the networking to distant databases and other host computers "can help students develop investigative skills, specifically those aspects of investigation necessary to effectively locate and retrieve information for undertaking reports, projects, and essays" (Heermann, 1988:70).

As a tool, computers can help teachers and learners in a wide variety of ways. Word processing, spreadsheet, statistical, graphics, and database packages are examples of the software that can be used across the curriculum. The development of hypercard, hypertext, interactive CD-ROM and video disk, and hypermedia provides examples of the true power of computers for enhancing the learning environment (Trotter: 1989). Within certain disciplines and programs, the "computer as tool" includes computer assisted drafting and manufacturing, robotics, and MIDI (musical instrument digital interface) in music programs.

The Benefits of Computers in Education

Van Horn, in supporting significantly increased use of computers in education, suggested that "if educators fight these inevitable changes, the American public school as we know it will cease to exist" (1991:527). Conversely, "the microcomputer is a tool of awesome potency which is making it possible for educational practice to take a giant step backwards into the nineteenth century" (Chandler, as cited in Wellington, 1990:60). These views represent extreme positions on the continuum regarding the benefits of computers in education. Streibel, who shared Chandler's view, argued that computers "represent a shift toward 'technologizing' education" (1986:158). The argument is based on the manner in which computers tend to control the learning process; where "technique is emphasized over grappling with content, then the innermost principles of that content are lost" (Ershov, as cited in Streibel, 1986:155). To Streibel, "the computer is an instrument of technique 'par excellence'" (1986:155). However, it is important to note that Streibel did not deny the effectiveness of the computer in enhancing learning, but rather, the concern was whether the learning is "holistic." Computerized learning does not address "the qualitative,

dialectical, and experiential domain of natural and social events" (Streibel, 1986:158).

The proponents of increased computer supported learning did not entirely disagree with the arguments presented by Streibel. They argued that the use of the computer in the classroom can liberate the teacher to spend more time on those elements which Streibel advocated as important to the learning process (Van Horn, 1991, Fasano, 1987, Riel, 1989, Kennett, 1990). Fasano reported on the results of an international survey which concluded that " computers have good potential in the tutoring of learning, although their use needs to be selective and their targeting careful" (1987:10) if maximum benefits are to occur. Riel stated that "students in all classrooms improved their reading and writing skills beyond grade level expectations" (1989:184) with the help of a word processing package. In Riel's study, the most impressive gains were made with teachers who had some experience with computers. Kennett supported this view and stated that "the computer-skilled, competent and active teacher, who recognizes individual strengths and differences, will be the key to quality education" (1990:406).

The foregoing review has covered some of the positive and

negative "pedagogical arguments" (Fasano, 1987:6) regarding the presence of computers in education. Fasano outlined two other determinants for increased use of computers in education: "the need of the economy" and the "need of society" (1989:5). There should remain little doubt that computers have penetrated into all aspects of society and as suggested by Kennett, "they must become commonplace in our schools" (1990:404). Khamis stated that "schools should become more technologically relevant in order to prevent the development of a generation of disenfranchised, easily manipulated adults" (1987:1). Dede expressed the position that computers will radically alter the way we work and that "education cannot escape transformation" (1990:40). Schools, as transformational institutions, can play a key role in the preparation of students for the information society of the future.

The Future Role of Computers in Education

According to Kennett, "the 1990s will see a boom in educational computing" (1990:408). Van Horn (1991) saw educational computing as essential to improving the productivity and quality of the educational system. What role will computers play? The Texas Board of Education's long range plan for technology indicated that "in

the long run, the technologies promise to alter what is taught (curriculum), how it is taught (pedagogy), where it is taught, when it is taught, and may induce debate on the whys of education" (1988:41). Wellington expressed a similar model which he called the "third wave" (1990:61). In the "first wave" computers were simply introduced as an instructional aid with little impact or influence. In the "second wave", the computer was used across the curriculum in more structured ways. "The third wave ... will occur when IT (information technology) influences the content and the aims of education itself, as well as the method and the system of teaching" (1990:61). Van Horn's review of educational power tools and their use in "integrated learning systems" (1991:530-3) lies somewhere between the latter two waves. Jacobs suggested that "the measure of infusion is the extent to which instructors make use of the computer as a tool for advancing their instructional tasks" (1986:7). However, the progress on this continuum will only occur if certain barriers to computer use in education are eliminated.

The Barriers to Computer Use in Education

The equivocation of academics and researchers on the benefits of computers in education tempers their widespread acceptance in the

classroom (Heermann, 1988:3, Streibel, 1986:158, Wellington, 1990:61). While there exists some earlier research such as Streibel's which questioned the value of computers in education, current evidence supports the contention that computers can make a significant contribution to learning under certain conditions.

A key ingredient to the successful implementation of information systems in the educational community is the availability of training. Without adequate training and familiarity with computers, implementation and the use of computers in classrooms will be less successful (Riel, 1989:184). Khamis noted that "substantial in-service courses are necessary to develop teacher competence and foster more positive attitudes towards using micros" (1987:4). Wellington suggested that teachers require technical assistance if computers are to make inroads across the curriculum (1989:B25, 1990:59).

The availability of good hardware and software for educational computing, as Gagne stated: "has always been, and remains, one of the most significant barriers to its widespread, effective use" (1987:297). "Lack of sufficient hardware to allow students individual work stations" is cited by Killoran as one of the chief reasons

impeding implementation. Khamis also found that access, or rather the lack of it, was a "factor preventing the use of micros" (1987:7). Wellington noted differences between the different levels of education and stated that primary schools are more poorly well-equipped than secondary schools (1989:B22). Clearly tied to the matter of access is the issue of funding, an impediment as seen by several authors (Wellington, 1989:B22, Wellington, 1990:62, Van Horn, 1991:528).

An often overlooked area is the support role played by administration. Jacobs stated that "administrative leadership will play an important role in the successful integration of computers with instruction" (1986:27). Khamis suggested that:

> School administrators must develop a better understanding of the major barriers preventing teachers from adopting effective applications of the new technology and must develop support structures within a school to allow teachers time to practice on the micros in order to improve their competence and develop a thorough understanding of the available software and its application (1987:10).

Jacobs summarized this section as follows: "enabling the instructor requires providing...time, money, software and hardware, training

and access to a variety of 'computer-related' information" (1986:25).

CHAPTER THREE

RESEARCH METHODOLOGY

Problem Restatement

The schools in the Selkirk College catchment area are using a wide variety of information systems to meet the instructional needs of their students. Many of these students will eventually enrol at Selkirk College and it is critical that the evolution of information systems in the schools' system be considered in the long term plans of the college. This study is the first stage of environmental scanning, an important component of planning, which requires an assessment of relevant trends and issues external to the college (Ferrante, Hayman, Carlson, and Phillips, 1988:50).

Population and Sample

The catchment area for the college includes six school districts which range in student populations from approximately 600 to 4,000 students. The primary research method for this study was the use of interviews. The number of people interviewed reflected the element of district size. For one of the two districts with less than 1,000 students, four professionals were interviewed, for the district with enrolments between 1,001 to 2,000, six professionals were

interviewed, and six to eight professionals were interviewed in the three remaining districts.

A representative from the central administration for each district was interviewed. These individuals varied considerably in job roles. They included an administrator responsible for information systems in the district, a district resource center administrator responsible for district wide educational technology, a school principal selected to coordinate information systems for the district, a senior level administrator responsible for instruction, and a superintendent.

The school representatives consisted of elementary, junior secondary and senior secondary teachers and librarians. More individuals were interviewed from the schools with higher levels. For instance, in the district with the most representatives, the distribution consisted of one central staff representative, four senior secondary representatives and three elementary representatives. The total sample size consisted of 30 professionals.

The District Superintendent for each school district was asked to identify individuals within the district who were perceived as leading users of computers in their respective districts. From these lists, individuals were contacted for the interviews. The interviews

lasted from approximately 30 minutes to an hour. All were held at the worksite of the interviewee.

Research Design

The primary research tool for this study was a structured interview as defined by Isaac and Michael (1987:138). The interview method was selected for two reasons:

(1) The data collected will form part of a future-oriented plan on instructional information systems for Selkirk College. A small selected population sample, with expertise in the subject area, was believed more appropriate for this study than a random sampling of the subject population which may include responses from many individuals with little experience in the use of computers in education.

(2) Since the researcher for this study was not conversant with the current state of computing in the subject schools, the interview method was "especially useful to explore a problem area about which insufficient information exists" (Isaac and Michael, 1987:132).

The purpose of the study was to determine the current state of computing in the West Kootenay's public schools and the interview

method was expected to produce satisfactory data from which to draw conclusions and produce recommendations. Best and Kahn indicated that when well done, "the interview is often superior to other data-gathering devices" (1986:186).

Description of the Interview Questionnaire

The questionnaire for the interview was designed to meet the following objectives:

(1) To determine the hardware and software which the interviewee is using in the classroom.

(2) To determine the hardware and software which the interviewee believes is being used in other classrooms in the school or district.

(3) To determine the hardware and software which the interviewee would like to have available for the classroom.

(4) To determine how the foregoing hardware and software is being used in the classroom.

(5) To determine the impact which the use of computers has had on the classroom.

(6) To determine whether any assessments have been undertaken on the effectiveness of computer use in the classroom,

school and district.

(7) To determine the perceived future role of computers in education.

(8) To determine the perceived barriers to the further infusion of computers in education.

(9) To determine whether any policies exist covering the use of computers in education at the school and district levels.

(10) To determine the training received and desired in regard to the use of computers in education.

(11) To collect demographic data which identify the interviewee's education, experience with computers and total experience as a professional.

The questionnaire provided for a well structured interview which enhanced the opportunities for comparability between the responses of the interviewees when the data were analyzed. The questionnaire for the interviews is included in Appendix A.

Administration of the Interviews

The District Superintendent for each school district was approached in person to discuss the purposes of the study, to seek approval to carry out the study in the district, and to solicit the list of

individuals to be interviewed. The summary results of the interviews were promised to the District Superintendents and each interviewee.

Each interviewee was contacted by telephone to introduce the purpose of the study and to set a time for the interview. An interview schedule was established for each school district. The interviews were scheduled at mutually acceptable places and times and approximately one hour was made available for each interview.

Analysis of Interview Data

The results for the interviews were summarized for each question. These summaries were then grouped under broad topics, designed around the major sections of the literature review. The data for the interview questions were thus assigned to one of the following categories:

(1) The importance of computers in education.

(2) The current status of computers in education in West Kootenay schools.

(3) The uses of computers in education in West Kootenay schools.

(4) The benefits of computers in education.

(5) The future role of computers in education in West

Kootenay schools.

(6) The barriers to computer use in education in West Kootenay schools.

The responses of the interviewees were analyzed and placed within each of the foregoing categories. A summary report of the information collected through the interviews was prepared along with conclusions and recommendations for the school districts to consider. A set of implications and recommendations for Selkirk College was also developed.

CHAPTER FOUR

RESULTS AND ANALYSES

Introduction

The purpose of this study was to determine the current situation regarding the use of information systems in the public school systems in the West Kootenay region of British Columbia. The primary research tool consisted of interviews conducted with individuals who worked in some of these schools.

Selection of Interviewees

The Superintendents for each of the subject districts were asked to identify some of their professional personnel whom they considered to be leaders within the district in the use of computers in education. There was no restriction on the type of use, the emphasis being on selecting individuals who were seen as being more conversant with information systems than their counterparts. The subjects were then contacted to arrange for an acceptable interview schedule. Except for two or three cases, the individuals contacted were very willing to be interviewed. The interviewees selected included librarians, teachers, principals, specialist staff, and senior district personnel.

The Interview Process

The interviews lasted from approximately 30 minutes to 90 minutes depending on time availability and the willingness of the interviewee to discuss a wide range of related topics. A predetermined set of questions (Appendix A) was used to guide the process, to provide structure to the interviews and to ensure greater consistency between interviews. With the able assistance of school secretaries, appointments were often scheduled back to back.

The remainder of this chapter will consist of a summary of the responses given during the interviews for each of the questions posed and the organization of this information under the broad categories defined in Chapter 3. This approach was deemed preferable to a detailed report on each interview.

Question Summaries

Question 1. Please describe the type of computer hardware which you have used in the classroom over the years.

Most individuals developed their expertise with computers on Apple based systems. Of the 30 people interviewed, 16 started out with the Apple II series, six with Commodore 64's, two on IBM/compatibles, two on Amiga's, one on a Sinclair and one each on

IBM, Digital and Honeywell minis and mainframes. The definite trend in recent years has been towards MacIntoshes and IBM/compatible systems. Amiga's were found in a few primary and elementary schools.

Question 2. What type of equipment are you using this year?

The most popular type of computer hardware used in the schools was the IBM/compatible system with close to two-thirds of the interviewees indicating this type. About one-third of the respondents were using MacIntosh-based systems with Apple's and Amiga's being mentioned occasionally. The school systems using MacIntoshes tended to use them across all grades, whereas school districts with IBM/compatible systems as the most common type of hardware, also had other types of equipment. The respondents in these latter districts often used more than one type of computer. The range of computers within each group covered the most common models such as MacIntosh SE's and Classics and XT's, 286's and 386's in the IBM/compatible labs.

Many of the upper grade level computer labs were networked and connected to a file server. Printer support for instructional purposes was mostly of the dot matrix variety. Laser printers were

available in some schools, but tended to be located in the main school office. Modems were not common devices in classroom-based systems; however, many of the respondents did have one at home. Most of the schools had a CD-ROM system in the library and some had scanning equipment. The computer to student ratio varied from one to six to one to ten with most schools having the lower ratio of one to ten.

Question 3. Please describe the type of software which you have used in the classroom over the years.

The software used by the subjects depended on the type of hardware used. The Apple users had experience with Appleworks and the MacIntosh and IBM/compatible users were familiar with MSWorks software. In addition to these two most common integrated applications, the range of software used varied widely from computer assisted instruction software to more sophisticated desktop publishing systems. Some individuals had used MacIntosh's hypercard application.

Question 4. What type of software are you using this year?

MSWorks was clearly the most common software package used in the school system. In the schools with Apple-based systems, Appleworks was the primary application used. Programming

languages such as Basic and Pascal were in common use. Several schools had Pagemaker on their computers for desktop publishing applications. Site specific applications included Wordperfect, Dbase IV, Lotus 123, Excel, Bedford (accounting), PC Globe, Carmen San Diego, Simcity, and Simearth. Libraries usually included an interactive CD-ROM system with various applications available. Some of the libraries, including elementary levels, used a computer based cataloguing application which was available for student searches.

Question 5. How are you using this equipment in the classroom?

The most common use of computers was for word processing applications. Students and teachers with greater experience had progressed to the use of desktop publishing systems. Database applications were also common in the higher grade levels. Typing tutor and keyboard applications were used extensively in the lower grades. Subject specific applications included spreadsheet, drafting, programming and communication software in the higher grades. Learning how to access CD-ROM's and carry out electronic data searches was common throughout all grade levels.

Question 6. How are you using this software in the classroom?

Students were using word processing applications to prepare their reports and related assignments. Database software was used to record results from surveys and other experiments. In the primary and elementary schools, much of the software simply permitted students to explore the technology and the medium. One principal described the primary computer lab as a "technology sandbox" where students go to discover and explore.

Teachers used computers for a wide range of applications. They used word processing and desktop publishing applications to prepare better looking documents and tests. Database and spreadsheet software supported student performance tracking activities. School management software was very common and was used for everything from tracking attendance to the production of anecdotal report cards

Question 7. What other type of equipment and software is being used elsewhere in the school?

Most interviewees were quite familiar with the information systems available in the schools; however, the wide range of software available was more difficult to identify. Everyone seemed to know

what was generally available, where to find it or who to contact for more information. The responses to this question tended to be a repetition of the earlier questions and further comment here would be redundant

Question 8. What other type of equipment and software is being used elsewhere in the district?

This question did not elicit a useful response for the purposes of this study. If there were any unique applications or hardware elsewhere, the interviewees were unaware of their existence. Most individuals were conversant with their immediate environment or referred the author to someone who was in a better position to answer the question.

Question 9. What benefits have you as a teacher received from using computers in the classroom?

The most common response was that computers helped teachers to prepare higher quality learning materials. Revisions and updating were made much easier through the use of word processing applications. The presence of information systems helped teachers to be more technologically current and computer literate. This helped them to provide a better role model for students. Another major

benefit resulted from the various records management tools available for teachers. These tools helped with time management by reducing the amount of time needed to update records, prepare reports and carry out analyses. The more capable users accessed question/item databases and were able to develop revised quizzes and exams more quickly. Many interviewees believed that the tools they were using helped them to fulfill their responsibilities better and to assist students with the primary task of learning.

Question 10. What benefits do you believe your students have received from the use of computers in the classroom?

Most teachers believed that students do better work because they have access to computers. In addition to the improved presentation quality of the assignments submitted, teachers indicated that students are quite willing to re-do or re-edit their material through the use of a word processing application, something that students who submit hand written work are reluctant to undertake. One teacher remarked that "quality of work submitted is not subject to the student's hand writing abilities." These conclusions are consistent with the views of Riel (1989:184).

Many teachers expressed the view that computer applications

contribute to higher level thinking, a desirable objective according to Van Horn (1991:528). The control aspects of computer programs help students to organize their thoughts into logical sequences, thus contributing to improved critical thinking skills and helping students to be better problem solvers. This conclusion was seen as a disadvantage by Streibel (1986:158) who felt that computers tended to control the learning process. Computers permit the use of simulations in the classroom and enable students to broaden their exposure to a wider range of environments. The quality of research work has improved through the use of CD-ROM's and database searches.

Many students are fascinated by the technology and are motivated by its use. Having an exposure to information systems is seen by many teachers as preparatory learning for entry into the information age.

Question 11. Have you undertaken any assessments or evaluative studies to support your beliefs?

None of the interviewees had undertaken any objective assessment or evaluations to ascertain the perceived benefits resulting from the use of computers in the classroom. Most were

quite convinced of their assumptions which were based on their subjective analyses based on many years of experience as teachers and users of the technology.

Question 11.1 If yes, can you briefly describe the activity.

Since none of the interviewees had carried out any activities or research in this area, this question was not answered. However, several individuals indicated that the question was certainly valid and, worthy of consideration in the future.

Question 12. Do you know if other school or district assessments have been conducted?

A few individuals indicated that some surveys had been completed by district computer committees and the Ministry of Education; however, these studies focused on inventorying hardware and software rather than on effectiveness issues.

12.1 If yes, can you briefly describe the activity?

The typical district survey consisted of an inventory of equipment and software available in the school and district. Its primary purpose was to provide a baseline for long term computer acquisition plans. The Ministry of Education's Education Technology Center carried out provincial surveys to determine the level of

activity across the system. Its most recent survey tended to focus on hardware, software and in-service levels and computer to teacher and student ratios.

Question 13. If resources were available to support your wishes, what future uses of computers in the classroom would you like to pursue?

The responses to this question covered a multitude of options. Some teachers were very conservative and desired simply a little more equipment and software. At the other extreme, several teachers shared Heermann's (1988:70) view and wanted to see each desk connected to external networks and electronic databases. These teachers believed their students would come to their classes with a notebook-sized computer which would be plugged into the aforementioned network. Most information would be delivered to the student via the computer with the teacher helping with access problems and clarification of concepts.

Many teachers believed that each class should be equipped with a few pieces of equipment and suitable software. At a minimum, the teacher should have a computer for classroom and administrative management purposes. An interactive CD-ROM in

each classroom with additional connectivity to the school library's electronic catalogue was seen as an important feature of tomorrow's school environment. A greater variety of software, especially simulation software, was a choice for many teachers.

Question 14. What do you think will be some of the likely future uses of computers in the classroom, recognizing the availability of resources and the current state within your classroom?

Most teachers wanted access to current software and the equipment upgraded to accommodate it. All students should have daily access to a computer for their needs. Additional computer lab support was seen as important, especially in schools with several dedicated computer labs. More modem equipped computers which permit students to access external databases were considered very likely in the near future. All libraries will be equipped with CD-ROM'S, have an electronic catalogue and provide access to electronic databases.

Question 15. Can you describe the computing skills your students will possess five years from now?

All students will leave the public school system with good to very good keyboard skills. One elementary school expected their

grade seven students to type at a corrected speed of 60 words per minute. All students would be expected to have mastered a good quality word processing package, have an understanding and familiarity with database applications, use CD-ROM databases and indexes and be able to access an electronic database. Many students will have used spreadsheets and more sophisticated desktop publishing software. Students graduating from the math and physical science disciplines would be expected to be able to program applications in Basic and Pascal languages.

Question 16. Can you describe the computing skills your students will possess ten years from now?

Many teachers were not prepared or willing to project into a ten year frame. These individuals recognized the tremendous changes which had occurred in the last few years and the rapidity of the changes occurring on an annual basis. The more venturesome focused on the possible hardware changes such as voice activated computers, tablet or slate-type computers which would recognize hand written text and interactive multi-media. Computers would become as common as calculators have become for most people. Access to electronic databases would become the major source of

information for students and more effort will be spent on learning to select and manage information. The flexibility of the information age will permit the era of customized learning, with students and teachers developing a personalized learning plan.

Question 17. What do you think are some of the barriers which are preventing you from using computers in the classroom?

This question was often asked from a more general perspective and addressed the broad use of computers in the classroom by educators rather than only individual use. The two most commonly mentioned barriers were "teacher attitude" and "financial resources." Unless teachers are prepared to use computers and to support their application in the learning process, limited progress will be made in the use of computers. Overcoming the resistance to change and developing an increased awareness of potential benefits from computer uses in education were seen as essential elements to the increased use of information systems in the classroom. Having the time to become familiar with information systems was seen as critical to increased use by professionals. Addressing the needs for equipment and software, for technical and maintenance support, and for in-service time and support clearly has significant financial

implications. Riel (1989:184), Khamis (1987:4) and Wellington (1990:59) supported the need for better and readily available in-service courses and technical support for teachers.

Question 18. Do you believe that you have had sufficient training to support your current uses of computers in education?

Most individuals interviewed believed they had the skills necessary to support their current applications and uses. Many of them had taught themselves in the use and application of information systems for personal and instructional purposes.

Question 19. Are there some specific training needs which you would like to pursue?

The possible needs covered the usual spectrum of computer applications. Telecommunications and networks were the most common interest area. Other selections included desktop publishing, business and accounting, drafting, programming, hypercard, spreadsheet, database, robotics, and unix software and applications

Question 20. Do you believe that from the available resources, the allocation for computer uses in education in this district is appropriate?

While most interviewees wanted to see more resources made

available, the majority of respondents indicated that the allocation process was appropriate and equitable. One or two respondents indicated that administrative needs superseded instructional needs and another believed that the better and more powerful machines should be placed in the higher grade levels.

Question 21. Recognizing that the available resources are limited, do you believe allocations for computer uses should be increased at the expense of other activities?

As noted in question 20, most people were satisfied with the practices followed. No one was prepared to suggest alternative decisions.

21.1 If yes, why do you feel this way?

As indicated above, no alternatives were suggested.

Question 22. Do you believe that the district's priorities for allocating computing resources between administrative and instructional uses are satisfactory?

For the most part, everyone interviewed was satisfied with the allocations in their district.

22.1 If no, why not?

In the one or two instances where the respondent disagreed, it

was because of the perception that administration needs were better addressed. In one case, the interviewee thought that decisions were being made by the administration and that the wrong equipment had been ordered.

Question 23. Do you believe adequate resources are being committed tc the use of computers in education?

The majority of the respondents indicated that more resources could be allocated for the use of computers in education. A significant number believed that British Columbia was ahead of other provinces in its overall allocation. The technology grants made available through the Education Technology Center had recently been drastically curtailed and several people indicated that their return would resolve the matter of adequate resources.

Question 24. Are there any policies in this school or district covering the use of computers in education?

24.1 If yes, what areas do they cover?

Most interviewees did not know of the existence of any specific formal policies. There was significant agreement that the district did not want illegal software used in the schools and there was some concern regarding copyright. Several districts had made decisions

regarding the hardware platform for schools to use; however, there appeared to be more flexibility in the choice of software. Most districts had an information systems committee or task force which usually had responsibility to recommend equipment and software purchases and budget allocations.

Question 25. Are you sufficiently involved in the purchasing decisions for computers and software in your classroom?

Without exception, all interviewees indicated that they were sufficiently involved in the decisions regarding hardware and software purchases for their school use; however, in some cases this was within the context of district-wide decisions regarding certain hardware and software platforms.

Question 26. Are you receiving adequate support services in the use of computers?

Approximately one half of the subjects indicated that they did not receive any support services and often had to rely on their own devices to solve problems. Those districts that had central technical support were thought not to have enough. Although seen as excellent resources, central support staff were often seen as overworked and unavailable when needed. This was particularly the opinion in

schools with several computer labs.

Question 27. Are there any changes which you would like to see occur in the use of computers in education in your classroom, school and district?

An increase in the amount of in-service training available was seen as a critical area to the expansion of computer use in education. Without this support, and the time to learn the new technology, the implementation would not develop to all parts of the system. More relevant and current hardware and software with adequate technical support services were also considered an important need. Another related improvement was access to hardware and contact with other users through networks and electronic conferences. One individual suggested that greater analysis of the benefits of computer use should be pursued.

Question 28. How many years have you been teaching?

The interviewees ranged in professional experience from four to 30 years. Four individuals had ten or less years of experience, 16 had 11 to 20 years and 10 had more than 20 years.

Question 29. How long have you been using computers to support your professional activities?

Computer experience ranged from two to twenty years. Seven individuals had less than five years of computer experience, ten had six to ten years, 11 with 11 to 15 years and two with more than 15 years.

Questions 30. What is your highest degree? year?

Half of the subjects had completed a master's degree, one individual had an elementary certificate and the remainder possessed a bachelor's degree. Thirteen of the individuals with a master's degree had completed it since 1980 whereas only five of the respondents with a bachelor's degree had completed it during the same period. Most had completed their studies prior to that time.

Question 31. What type of short courses in computing have you taken?

Although most interviewees were self taught in most of the applications they used, many had taken computer related courses. A few individuals had completed one or more computer science courses during their undergraduate studies. The courses taken included integrated packages, word processing, spreadsheet, database, hypercard, desktop publishing, and accounting applications. Two individuals had completed maintenance related courses.

Question 32. Do you have a computer at home?

Twenty-six of the interviewees had a MacIntosh or IBM/compatible computer at home. Three individuals had two machines and seven had modem equipped systems.

Other Findings

During the interviews it became obvious that some teachers in the schools were making extensive use of computers to support educational activities. Students were exposed to computers in the earliest years with some schools providing an hour per week for entering first graders. Seventh graders in the same school were getting an hour per day in the computer lab. The role which the schools will play in computer education ten years hence once these primary students reach the higher grade levels is difficult to imagine. Most school libraries made use of the technology with CD-ROM databases and electronic circulation and catalogue systems.

The equipment appeared to be current with 386 level systems available in some elementary and secondary schools and MacIntosh LC's beginning to appear. Software costs tended to restrict computer labs to integrated packages such as MSWorks. Although a wide variety of software seemed to be available, it appeared to be single

copies and its use thus limited.

There were some rather unique projects such as the "Writers in Electronic Residence" which involved students in grades four to seven in 45 selected schools across Canada. Students in this school produced electronic versions of written work which were then transmitted via modem to Simon Fraser University. The University then forwarded the text to a published author who would critique a student's submission. The critique was then returned to the student using the same telecommunication system. Having a "real" writer comment on one's writing had a powerful influence on the students and community.

Each district appeared to be moving in a different direction with respect to computer uses in the schools. Some districts left schools to their own decision processes regarding hardware and software purchases. In these districts equipment and computer use varied considerably from one school to the next with no apparent mechanisms in place to ensure coordination between levels. Other districts had specified equipment policies at all levels. This latter approach provided greater coordination and reduced the amount of support which a district had to provide. There were wide variations

in the level of financial resources made available for information systems from one district to another. Some school principals had to share their secretary's machine, whereas others functioned with a networked system for administrative purposes.

One of the purposes of this study was to draw some general or broad observations about the use of computers in education. The review of the literature helped to define some broad categories under which the information collected could be collated. These same categories will now be considered.

Importance of Computers in Education

The individuals interviewed were committed to the use of computers in education and all believed that more could be accomplished in this respect. Most of the interviewees had taken the initiative to introduce computers in their classrooms, labs or other work areas. These people often expressed the view that they would like to see more of their colleagues make use of computers and the available applications. Most were convinced that the availability of and access to computers enhanced the learning environment of the school.

Current Status of Computer Use in Education in West Kootenay Schools

All of the schools were committed to the use of computers in education. The availability varied considerably between districts; however, all were trying to upgrade their systems. Computer labs were available in most schools, regardless of level and in the few schools without a dedicated lab, equipment was located in individual classrooms. MSWorks was the most common software application. The libraries in most schools were equipped with interactive CD-ROMs and several had electronic cataloguing systems. The secondary libraries also provided access to electronic databases such as Dialog. The ratio of computers to students ranged from one to six to one to ten, much higher than the literature suggested. Teachers, other than those interviewed, did not appear to have easy and ready access to computers.

Uses of Computers in Education in West Kootenay Schools

The most common use of computers in elementary schools was for keyboard skills and at the secondary level it was for word processing activities. Teachers at all levels made extensive use of computers for word processing applications and to a lesser extent,

spreadsheet and database applications. Many schools were moving towards packaged school management software which assisted with enrolment records and reporting functions. Students used word processing applications to prepare assignments and reports. Some students had progressed to desktop publishing software such as Pagemaker for the preparation of school newspapers and annual yearbooks. Teachers used word processors for the preparation of instructional materials and tests. They also used computers for various recordkeeping and reporting activities.

At the primary and elementary levels, computers were used to expose students to the new technology. In addition to basic word processing applications, keyboard skills were being developed at all grade levels. The expectation of teachers was that grade seven students would reach an average keyboard skill of 60 corrected words per minute. Exploratory programs such as Simcity, Simearth and Carmen San Diego were common. Many students in these schools were taught to use CD-ROM's for information searches and retrieval. Most CD-ROM systems had encyclopedia, geography, botany, zoology and history discs.

Benefits of Computer Use in Education

Most teachers were clearly of the view that the use of computers in the schools was beneficial to the learning process. Teachers believed that they were doing a better job of preparing materials and were more inclined to update handouts and tests because of the capabilities of word processors. Certain teachers had mastered the use of databases and were using test item databanks to prepare their own tests. One individual was participating in the development of a provincial test item databank which, when completed, would contain thousands of questions. Many teachers were using spreadsheet and database programs to manage the keeping and analysis of marks and grades. The teachers who had mastered the school management software were pleased with the support it provided for record keeping and the production of anecdotal reports to the parents.

Although teachers saw themselves as benefiting from the presence and availability of computers, the students were seen as the greater beneficiaries. Students were more motivated and excited when they worked with computers, especially so in the elementary levels. Computer labs were kept open for extended hours and were

being used by students both before and after regular classes.

Students' written work was much improved according to the teachers interviewed. Students were much more willing to re-do their assignments with the availability of word processing. In more advanced grades, the use of spelling checkers and grammar utilities contributed to the improvement of written submissions. The use of CD-ROM's and the downloading of text and graphics added an element of professionalism to student work. Electronic database searches supported the research activities of students in various subject areas.

In addition to these "across the curriculum" activities, computers were used to support discipline specific needs. In the lower grades, software was available to directly support instruction with drill and practice type software. As previously mentioned, exploratory software such as Simcity enhanced geography classes. Students graduating from business classes were better prepared for business careers in some schools which had the typical software in use in local firms and organizations. Programming languages were common in the higher grade levels and prepared students for further study in post secondary institutions.

Future Role of Computer Use in Education in West Kootenay Schools

The immediate goals of teachers and administrators varied considerably across the schools. Without exception, however, all interviewees wanted to see more equipment, better equipment and the latest in software available in their schools. Most respondents believed that teachers should have access to a computer on their desks. This computer would be networked to the administration network for the daily record keeping activities of teachers. The unit would also be connected to the library system and have access to the catalogue and other information databases.

Students would have greater access through increasing the number of the traditional 20 to 30 station computer labs. For some teachers, the desired solution was the availability of several work stations located within each classroom. These technology pods would consist of five to six work stations networked to printers and CD-ROM's.

On the software side, many teachers wanted access to better software for their students, especially in word processing and desktop publishing applications. Computer science teachers wanted access to classroom sets of the more advanced programming languages such as

C++ and other object oriented programs. Some were interested in teaching with expert systems languages such as Prologue. Librarians wanted a greater variety of CD-ROM's and access to online databases.

The long term view of the interviewees ranged from "more of the same" to each student having a personal notebook computer. This notebook computer would be the only information source which the student would require. With it, the student would communicate with the teacher's information database as well as other databases. The personal system would permit the student the utmost in flexibility, to the point where the student could take a customized curriculum, albeit, approved by the teacher. For some teachers, this type of learning environment was necessary if the Province's Year 2000 curriculum was to be fully implemented.

Barriers to Computer Use in Education in West Kootenay Schools

The barriers to the use of computers in education identified through the interviews focused on two major areas: attitude and financial resources. Many felt that computers would not become more common until more teachers were willing to accept their presence in the classroom. Teachers had to become role models for their students in this regard and be seen as regular users of the new

technology. The availability of more financial resources was seen as a remedy to many of the attitudinal problems as well as a means of access to better and more equipment and software.

With additional resources, schools could provide more frequent and higher quality in-service opportunities for teachers. This support was seen as critical for teachers who already perceive their workloads to be heavy. Adding the burden of learning a new technology, despite the benefits, was not a priority for many. While many schools had made significant inroads in the implementation of computers in their schools, many were concerned that a financial plateau had been reached and that further resources and enhancements would not be as forthcoming as they had been in recent years.

Another common need, but not as prevalent as the other two, was the provision of technical support services for teachers and students. Some districts had introduced centralized support. While this was considered a worthwhile expenditure, the workloads of these technicians were not perceived as adequate to the needs of some of the larger schools which had several labs, 90 to 120 machines in total and also peripheral equipment. Many of the more experienced computer teachers were constantly being called on to carry out minor

maintenance related tasks and to provide software support to their colleagues who were less well prepared for the new technology. Some felt they were reaching the point of burnout.

Summary

The schools visited for the purposes of this study appear to have implemented a high degree of computerization in their teaching and administrative responsibilities. There exists a strong commitment to, and solid enthusiasm for, the increased use of computers in the schools. The existence of district wide computer committees in several districts, and their planned implementation in the others, indicates solid policy support for the continued expansion of information systems. Time will tell whether the resources will be available to meet the challenge.

CHAPTER FIVE

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This study examined the state of computer use in the schools of the West Kootenay region of southeastern British Columbia. The region contains several small cities with populations varying from 7,500 to 10,000 residents and many smaller communities with populations ranging from 500 to 5,000 people. The schools within this region reflect this diversity of population density in both size and resources. The larger districts certainly appeared better endowed with information systems and their state of evolution was ahead of the other districts. However, within some of the smaller districts there were examples of unique pilot projects such as the "Writers in Electronic Residence" project discussed in Chapter Four.

In order to provide a focus for the study, six broad areas were examined and the results reported in Chapter Four. This Chapter will briefly review these findings, draw conclusions and make recommendations for each of the identified areas.

Importance of Computer Use in Education

Findings

The literature provides ample evidence that the use of

computers in education can make a contribution to the learning process in the schools. The teachers interviewed in this study certainly confirmed this position. Although district support varied from one area to another, there was evidence that the use of computers in education was considered important. All districts had some form of centralized process in place for dealing with computer use in the schools or were in process of establishing a district level committee or task force.

Conclusions

The districts and schools visited in the West Kootenay region consider the use of computers in education to be an important activity. Further initiatives are being taken to expand this use throughout the respective systems and across the curriculum.

Recommendations

It is recommended that the schools continue with the expansion of the use of computers in the schools. The use of district-wide committees and the preparation of long term plans will contribute to implementation of a progressive and carefully thought out agenda.

Current Status of Computer Use in Education in West Kootenay Schools

Findings

There is evidence which confirms that computers are common in West Kootenay schools. The ratio of computers to students is very high in comparison to the examples described in the literature. Equipment and software are available at all grade levels from kindergarten to grade 12. Access to computers for students appears to be adequate; however, class sets of software, although adequate, are not extensive.

In some districts, there does not appear to be significant coordination across the district. Schools, and in some cases teachers, are making the decisions regarding the direction to take with regard to computer use in education. This approach, while laudable for reasons of autonomy and professional discretion, may prove costly in the long term and reduce the overall impact of the available resources for information systems.

Conclusions

The school districts within the West Kootenay region appear to have made tremendous gains in the use of computers in the schools

for learning and administrative purposes. The presence and creation of computer task forces and committees will help to ensure greater coordination and the sharing of resources. A few districts and some of the schools had developed long term plans regarding computer use; however, most of these had already served their useful life.

Recommendations

The districts should continue to support the existence of district-wide committees and ensure that their terms of reference include the need for increased coordination among the schools. All districts should have in place a long term plan which is updated annually in order to keep pace with the rapid changes taking place in the field of information systems. The long term plan should articulate the learning goals which the plan is intended to support. Increased coordination between the districts and other educational organizations in the region should become a priority for all.

Uses of Computers in Education in West Kootenay Schools

Findings

The development of keyboard skills, the use of word processing applications and the pursuit of research activities through the use of CD-ROM's and online databases were the most common uses of

computers by students and teachers. The more experienced teachers were using computers for a variety of administrative functions.

Conclusions

Teachers and students will continue to expand their use of computers in education. With time and more resources, more teachers will access the techniques and benefits which computers can provide to the learning process and to support their classroom management responsibilities. The continued expansion in the number of users will place increased pressure on schools and school districts for more resources for the enhancement and expansion of information systems in the schools. This growth will increase the significance of planning processes and committees previously recommended.

Recommendations

Each school and district needs to establish and maintain a dynamic planning process for information systems. Owing to the rapid changes taking place in information systems equipment and software developments, the time horizon for these plans does not have to be long. A more important feature of the planning process should be the ability to update and revise the plans annually.

Benefits of Computer Use in Education

Findings

The people interviewed were firm in their belief that computers in the classroom and school were a great benefit to both teachers and students. Many were of the opinion that students were learning more, and learning material better, as a result of the use of computers. The primary contributor to this fact was the ease with which school work could be completed with computers. On a more sophisticated level, many teachers believed that computers helped students with their critical thinking skill because of the structured design and organization specified by computer applications. However, there was no evidence that anyone had undertaken studies to confirm these conclusions or was aware of studies which had been carried out elsewhere.

Conclusions

The interviewees were convinced that computers in the schools had helped them to do a better job of teaching and had contributed to the students' learning. The absence of any empirical evidence to support these opinions was disappointing, but not surprising considering the workload of teachers and the dearth of resources to

support such activities.

Recommendations

The resources being committed to the support of computer use in education are very extensive. Such expenditures are worthy of some confirmation that the means justify the ends. Even if the districts cannot afford to carry out their own assessments, information on the studies carried out elsewhere should be readily available to teachers. The district-wide committees should consider such an activity to be one of their responsibilities.

Future Role of Computer Use in Education in West Kootenay Schools

Findings

The long term perspective of teachers on the future uses of computers in education varies considerably among the people interviewed. Recognizing this wide variation among those considered to be on the cutting edge of information systems within the different districts, suggests even wider potential variations across the full spectrum of teachers within a district. These perceptions will present significant challenges to those charged with the responsibility of preparing a cohesive long term information systems strategy for the

district.

Conclusions

There appear to be wide variations among the professional personnel in the school districts and within the school, regarding the future role which computers will play within education. This finding is compounded by the lack of any real coordination within some districts.

Recommendations

The districts need to provide more in the way of general awareness programs on the role and purpose of computers in education. Close attention has to be given to the individuals who are avoiding using information systems, and thus, preventing the schools from realizing the full potential of the new technology. The district's long term strategies regarding information systems need to be well circulated to ensure broad participation in the evolution of information systems uses within the district.

Barriers to Computer Use in Education in West Kootenay Schools

Findings

The two most common barriers cited by interviewees to the use

of computers in education appeared to be attitudes held by the professional staff and a lack of financial resources. These two barriers were also seen to be interconnected in that adequate resources were seen to be a part of the solution to attitude issues.

Conclusions

Many of the individuals who are using computers in the schools have taken the initiative themselves and made extra efforts to introduce students to the technology. There were several examples where school personnel had made the initial investment and had brought their own information systems into the classroom or work area. These practices were still in evidence in some districts. This small cadre of committed and interested individuals will not suffice to ensure a broad implementation of information systems technology across the curriculum in all schools.

Recommendations

Schools and districts which want all teachers to make use of the technology will have to provide increased in-service opportunities for the non-users. Additional support may be required to provide time for certain individuals to become accustomed to the technology. The use of and exposure to assessments which attest to the benefits

of information systems use in schools should be promoted. Such assessments should be easily available and circulated regularly.

The findings and conclusions reached as a result of this study have refuted some of the initial beliefs stated in Chapter One. While there is evidence that information systems are evolving on a haphazard basis in some cases, evolution as a whole is occurring throughout the region. The low ratio of students to computers is significant and suggests that tremendous resources have been made available to implement the technology.

Implications for Selkirk College

This study was undertaken, in part, to provide some information which would be of value to Selkirk College in the development of its long term information systems planning strategy. The study indicated that the school districts in the West Kootenay, the primary source of future students for the college, have introduced extensive information systems equipment and applications. The challenge for Selkirk College will be to keep pace with this evolving process and to develop strategies which will help keep it abreast, if not ahead, of the schools within its region.

Recommendations

Selkirk College should initiate a process whereby it can stay abreast of the developments occurring in the regional schools. The college should undertake to establish liaisons with the various district level information systems planning committees. As a minimum, the college should ensure that it receives copies of school or district information systems planning documents. These liaisons can be augmented through the provision of college computer accounts to district personnel who are playing a leadership role in school system information systems applications. An annual meeting sponsored by the college could bring these individuals together to outline developments and provide an opportunity to share views and opinions on the future use of computers in education.

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APPENDICES

APPENDIX A

INTERVIEW QUESTIONNAIRE

Introduction: Thank you for agreeing to participate in this study on the state of computing in the public school system in the West Kootenay. You are viewed as one of your district's "experts" in the use of computers in education. Your responses will help to guide the college in the development of its long term plans for instructional computing.

QUESTIONNAIRE

1. Please describe the type of computer hardware which you have used in the classroom over the years.

2. What type of equipment are you using this year?

3. Please describe the type of software which you have used in the classroom over the years.

4. What type of software are you using this year?

5. How are you using this equipment in the classroom?

6. How are you using this software in the classroom?

7. What other type of equipment and software is being used elsewhere in the school?

8. What other type of equipment and software is being used elsewhere in the district?

9. What benefits have you as a teacher received from using computers in the classroom?

10. What benefits do you believe your students have received from the use of computers in the classroom?

11. Have you undertaken any assessments or evaluative studies to support your beliefs?

    11.1 If yes, can you briefly describe the activity.

12. Do you know if other school or district assessments have been conducted?

12.1 If yes, can you briefly describe the activity?

13. If resources were available to support your wishes, what future uses of computers in the classroom would you like to pursue?

14. What do you think will be some of the likely future uses of computers in the classroom, recognizing the availability of resources and the current state within your classroom?

15. Can you describe the computing skills your students will possess five years from now?

16. Can you describe the computing skills your students will possess ten years from now?

17. What do you think are some of the barriers which are preventing you from using computers in the classroom?

18. Do you believe that you have had sufficient training to support your current uses of computers in education?

19. Are there some specific training needs which you would like to pursue?

20. Do you believe that from the available resources, the allocation for computer uses in education in this district is appropriate?

21. Recognizing that the available resources are limited, do you believe allocations for computer uses should be increased at the expense of other activities?

21.1 If yes, why do you feel this way?

22. Do you believe that the district's priorities for allocating computing resources between administrative and instructional uses are satisfactory?

22.1 If no, why not?

23. Do you believe adequate resources are being committed to the use of computers in education?

24. Are there any policies in this school or district covering the use of computers in education?

24.1 If yes, what areas do they cover?

25. Are you sufficiently involved in the purchasing decisions for computers and software in your classroom?

26. Are you receiving adequate support services in the use of computers?

27. Are there any changes which you would like to see occur in the use of computers in education in your classroom, school and district?

28. How many years have you been teaching?

29. How long have you been using computers to support your professional activities?

30. What is your highest degree? year?

31. What type of short courses in computing have you taken?

32. Do you have a computer at home?

Thank you for your cooperation and assistance. Your responses have been very supportive to this study. Are there any questions which you would like to ask me? Would you like a copy of the summary of the results from these interviews?

APPENDIX B

LIST OF INTERVIEWEES

Jean Bassett, Arrow Lakes School District

Scott Campbell. Grand Forks School District

Bonnie Cook, Grand Forks School District

Ed Crape, Trail School District

Hans Cunningham, Nelson School District

John Eggleton, Castlegar School District

Lach Farrell, Castlegar School District

Darcy Garland, Nelson School District

Dave Hogg, Castlegar School District

Doug Jerome, Nelson School District

Denny Kemprud, Grand Forks School District

Ed Koochkin, Arrow Lakes School District

Vic Manson, Nelson School District

Ken McLean, Trail School District

Dave Nutini, Trail School District

Tom Patterson, Arrow Lakes School District

Gordon Player, Trail School District

William Reid, Nelson School District

Raylene Samura, Castlegar School District

Dave Simpson, Nelson School District

Floyd Smith, Trail School District

Michael Strukoff, Grand Forks School District

Dean Studer, Nelson School District

Rod Templeton, Grand Forks School District

Diane Thompson, Trail School District

Stosh Uchida, Castlegar School District

Henning Von Grogh, Arrow Lakes School District

Marlene Wallace, Castlegar School District

Wendy West, Nelson School District

Paul Wood, Grand Forks School District

APPENDIX C

BACKGROUND DATA ON INTERVIEWEES

YEARS OF TEACHING EXPERIENCE	YEARS OF COMPUTING EXPERIENCE	HIGHEST DEGREE	YEAR EARNED	COMPUTING COURSES TAKEN	HOME EQUIPMENT *HAS MODEM
16	10	MASTER	81	WP	MAC.
11	8	MASTER	88	PROG.LNG.	PC*
18	14	MASTER	81		MAC.
12	6	MASTER	91	HYP/MSW/COMM.	
25	10	MASTER	81	CP.SC.11	2 MACS.
22	13	MASTER	80		2 PC'S
11	11	MASTER	91		PC
18	11	MASTER	86		PC
20	6	BACHELOR	80	CAD/MSW	PC
5	5	BACHELOR	83		
30	12	BACHELOR	68	123/DTB/WP	2 PC'S*
4	2	BACHELOR	85	WP/LIB-CAT	
13	4	MASTER	88	ACC.	PC
27	11	MASTER	81	HYP/MSW/DTP	PC
27	10	MASTER	80	DTP/NETWORK	MAC*
12	18	BACHELOR	78	CP.SC.	PC
23	10	BACHELOR	68		PC*
20	5	BACHELOR	81	HYP/MSW/LOGO	MAC*
17	11	BACHELOR	72	CP.SC.	MAC
24	12	BACHELOR	65		PC
30	8	MASTER	77		PC
25	12	BACHELOR	65	MAINT.	PC
19	10	MASTER	86		MAC
18	11	MASTER	78	TROUBLESHOOT	PC
20	10	EA	61	WP/DTP	PC
9	20	BUS.ADM.DIP		LOTS	386 PC*
10	8	BACHELOR	81	DRAW/TURBO	PC
20	7	BACHELOR	72		
23	14	BACHELOR	73	WP/DTB/123	PC*
15	5	MASTER	76	PROG.LNG.	386 PC*

ABBREVIATIONS:

123 = SPREADSHEET APPLICATION
ACC. = ACCOUNTING APPLICATION
CAD = COMPUTER ASSISTED DRAFTING
CP.SC. = COMPUTER SCIENCE COURSE
DRAW = DRAWPERFECT
DTB = DATABASE APPLICATION
DTP = DESKTOP PUBLISHING
HYP = HYPERCARD/HYPERTEXT
LIB-CAT = LIBRARY CATALOGUING APPLICATION
MAINT. = MAINTENANCE
MSW = MICROSOFT WORKS APPLICATION
PROG.LNG. = PROGRAMMING LANGUAGE (BASIC,PASCAL)
WP = WORD PROCESSING APPLICATION